Near-Infrared Interferometry of Young Stellar Objects (YSO)

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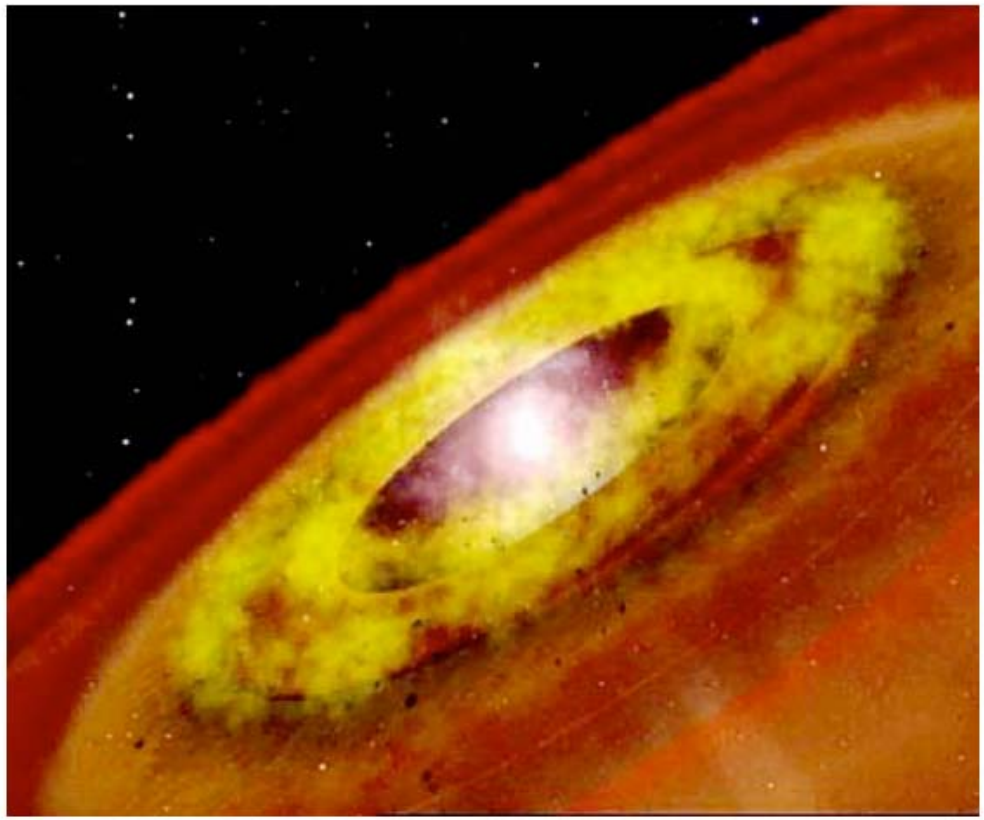
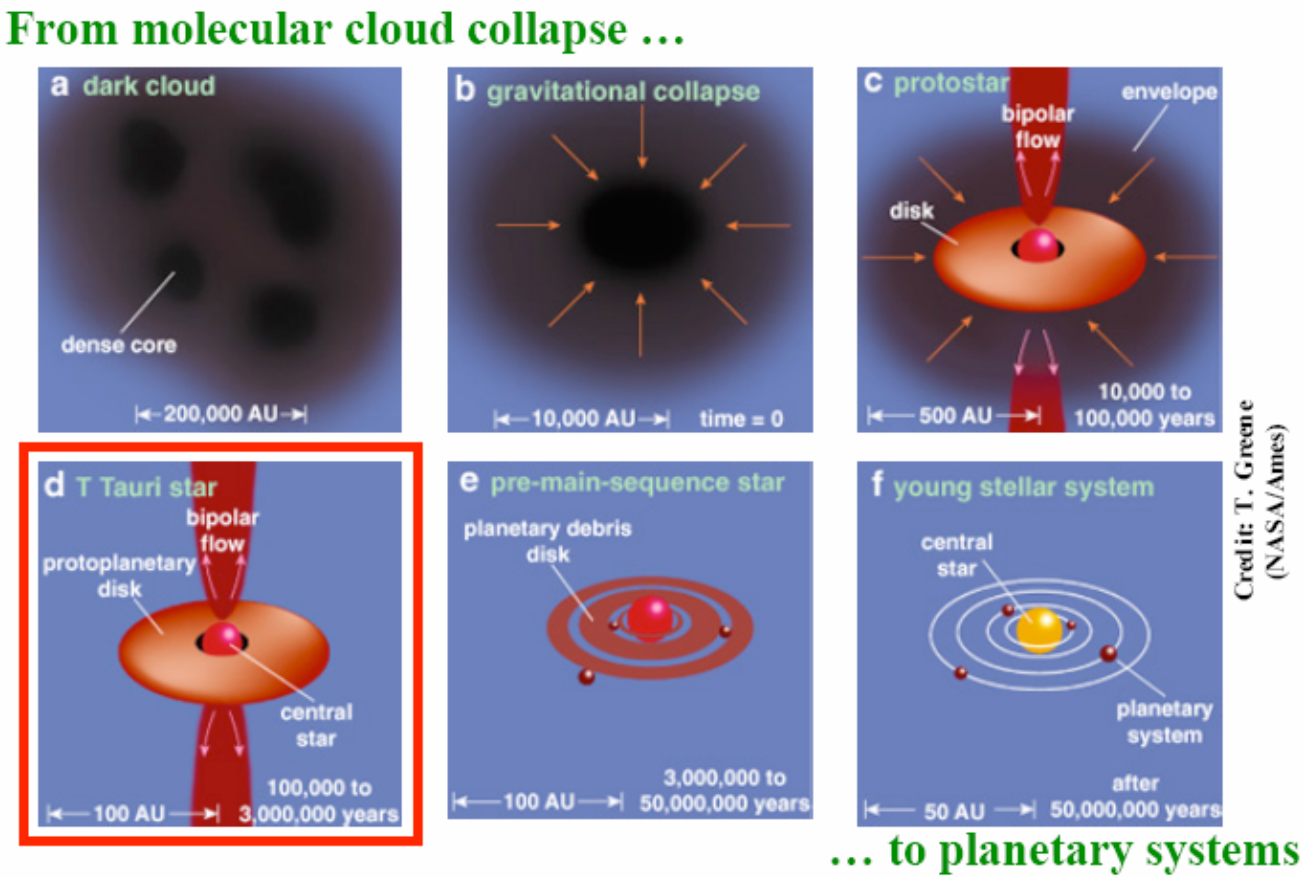


Outline

- Motivation for YSO disk science
- Motivation for optical interferometry in the NIR
- Proposal for VLTI/AMBER observations
- Summary

Motivation for YSO disk science

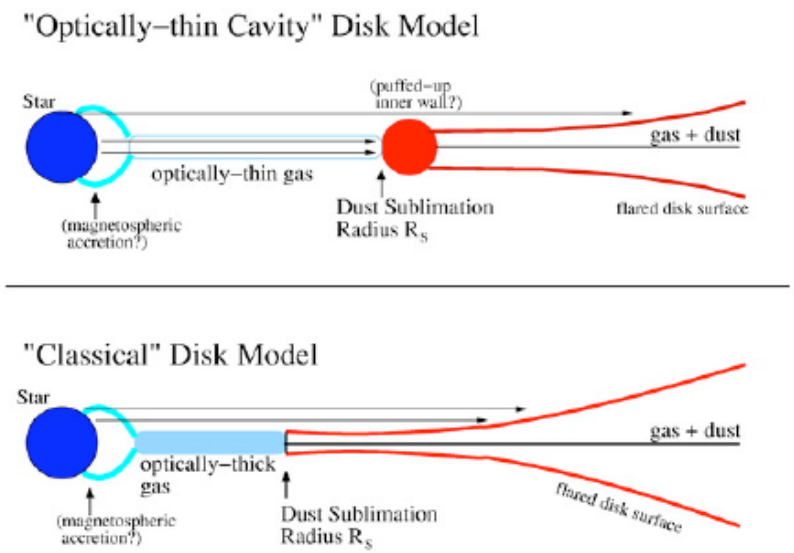


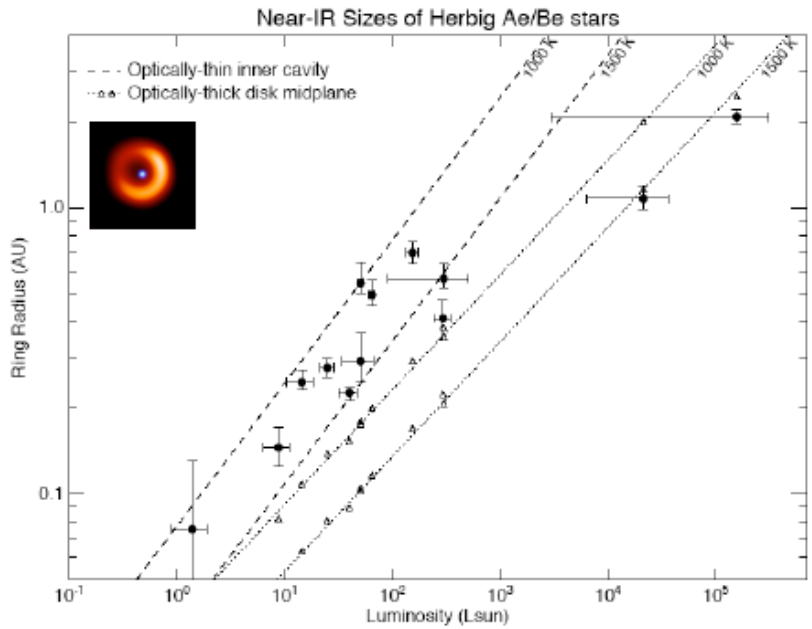
Young pre-planetary disks are important for star formation (conduits for accretion onto star) as well as planet formation (reservoirs of planetary material). YSO are toy models for AGN

Motivation for NIR interferometry

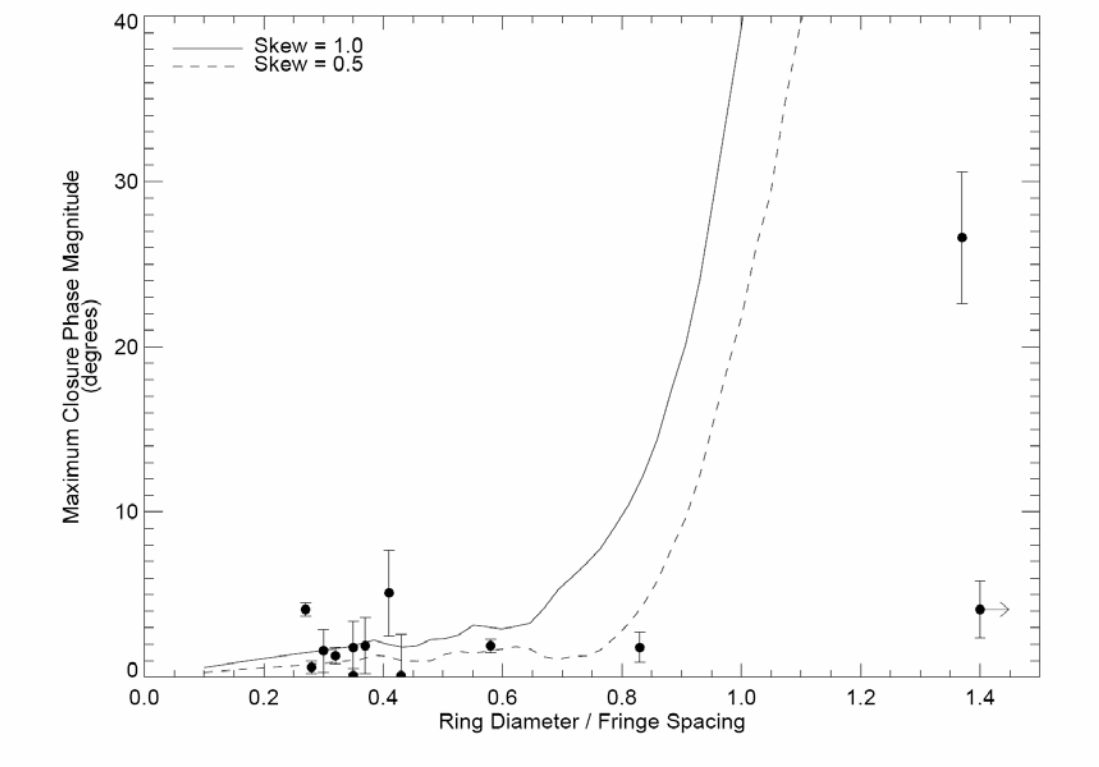
- NIR wavelengths probe the hottest inner disk material (1000-3000K)
- B ~ 100m, 2.2 μm => resolution ~ λ/2B = 4mas or 0.7 AU at 150 pc
- Sensitivity is good enough for current generation of interferometers

1. Establish a tight size-L relation for HAe and late HBe
2. Determine the appropriate disk model, e.g. early types are undersized in these models, indicating some gas optical depth inside inner dust cavity, and perhaps different accretion mechanism, “puffed-up” inner wall disk models





Motivation for NIR interferometry (CP)

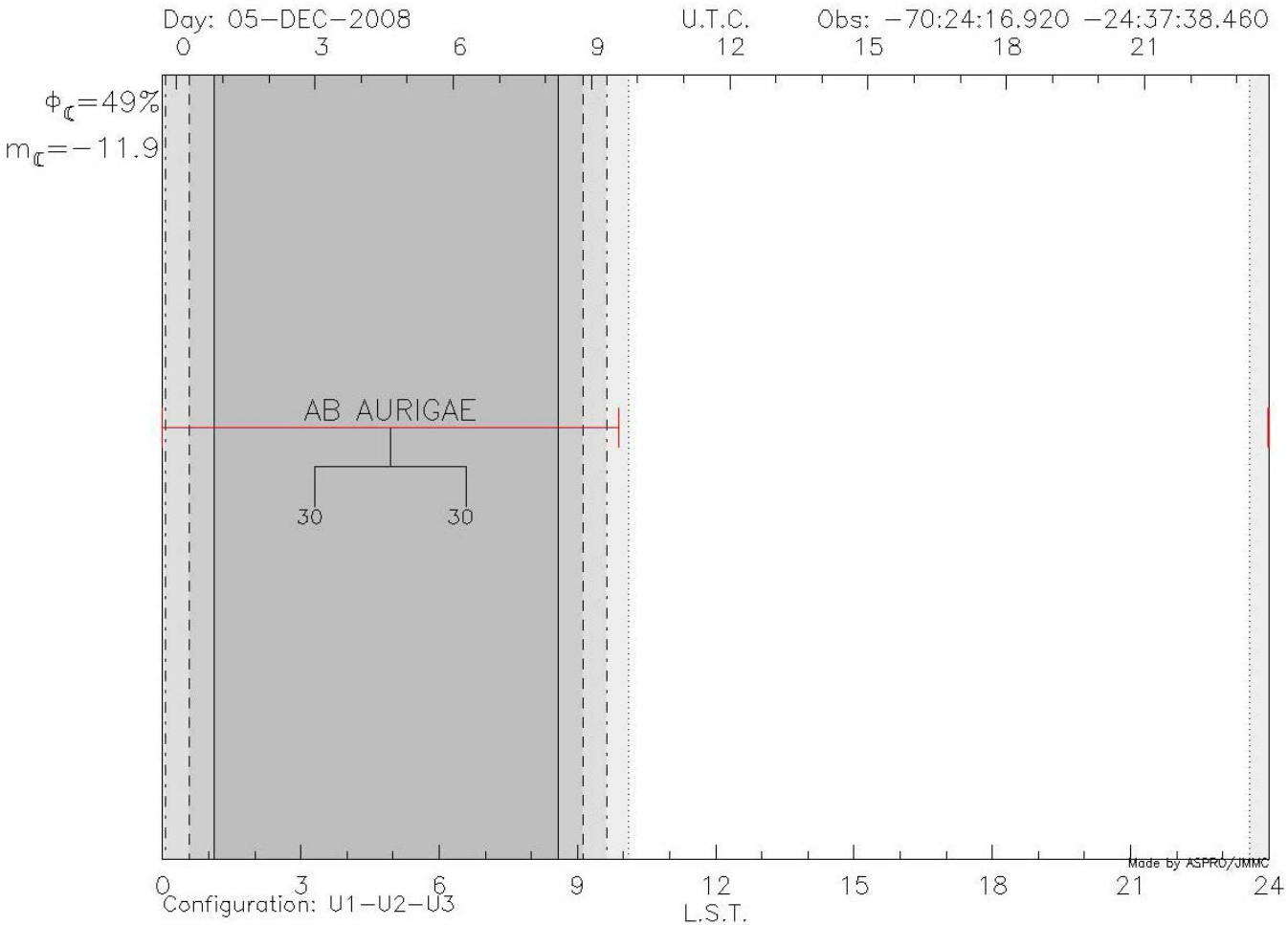


3. Maximum predicted closure phases for skewed ring models as a function of the skew amount and angular resolution of interferometer. The line for skew =0 is identically zero due to centrosymmetry. Note that most systems are not resolved enough to constrain the skewed models, calling for longer-baseline interferometers such as VLTI.

Proposal for VLTI/AMBER observations

14 well selected objects spanning HAe and late HBe

AB Aurigae Observability



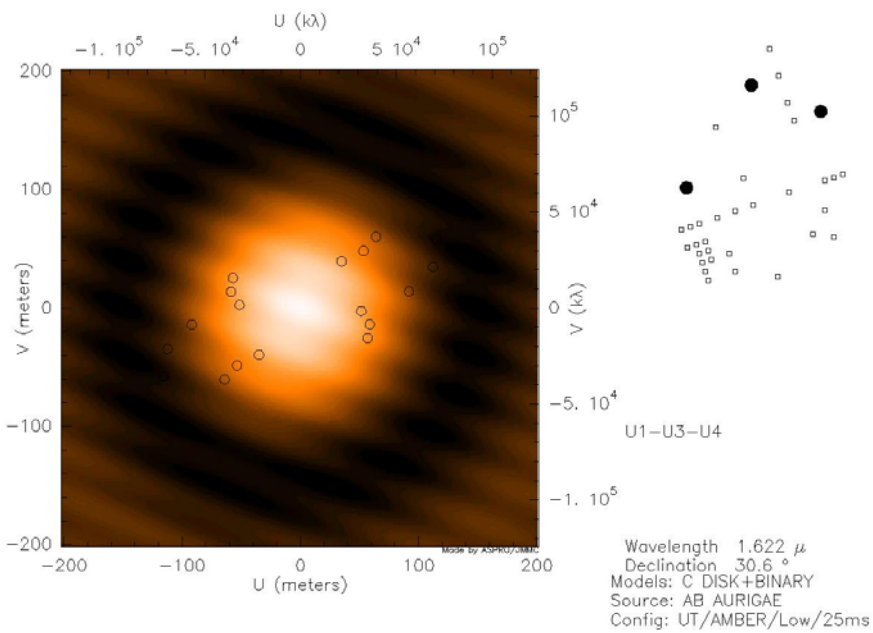
Calibrators:

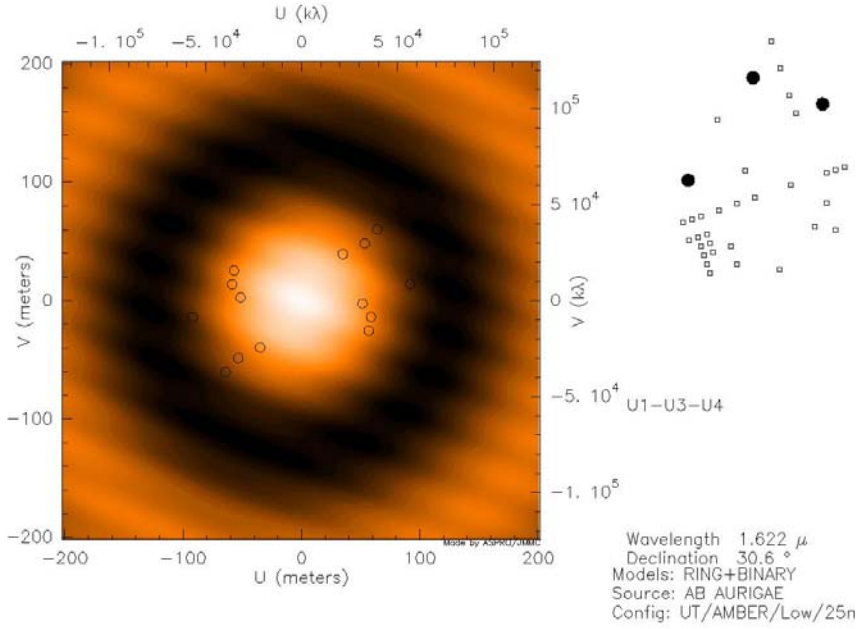
- HD32406 (K0 III, V=6.2, H=3.6) 1.2 mas

- HD31233 (K0, V=7.2, H=4.6) 0.6 mas

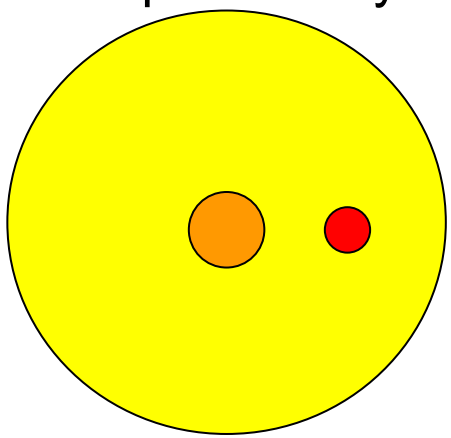
Proposal for VLTI/AMBER observations

(u-v) Coverage U1-U3-U4

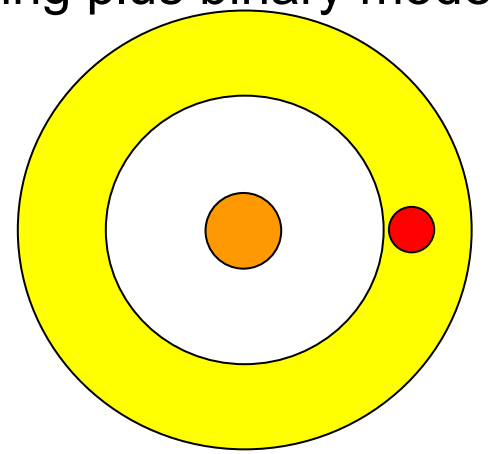




Uniform disk plus binary model

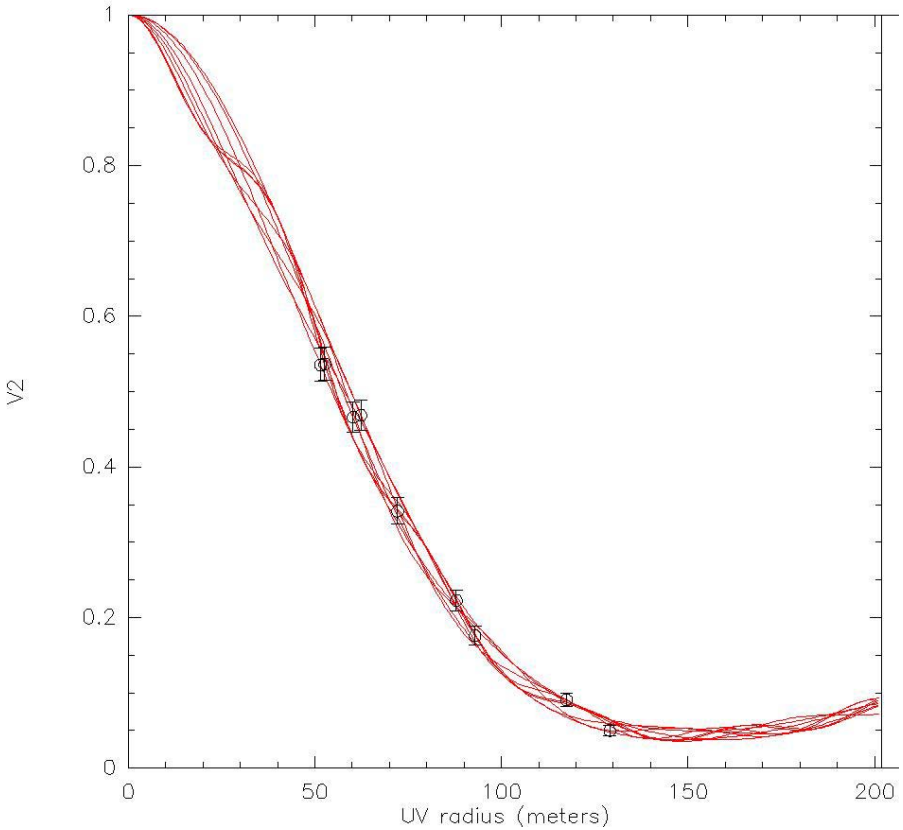


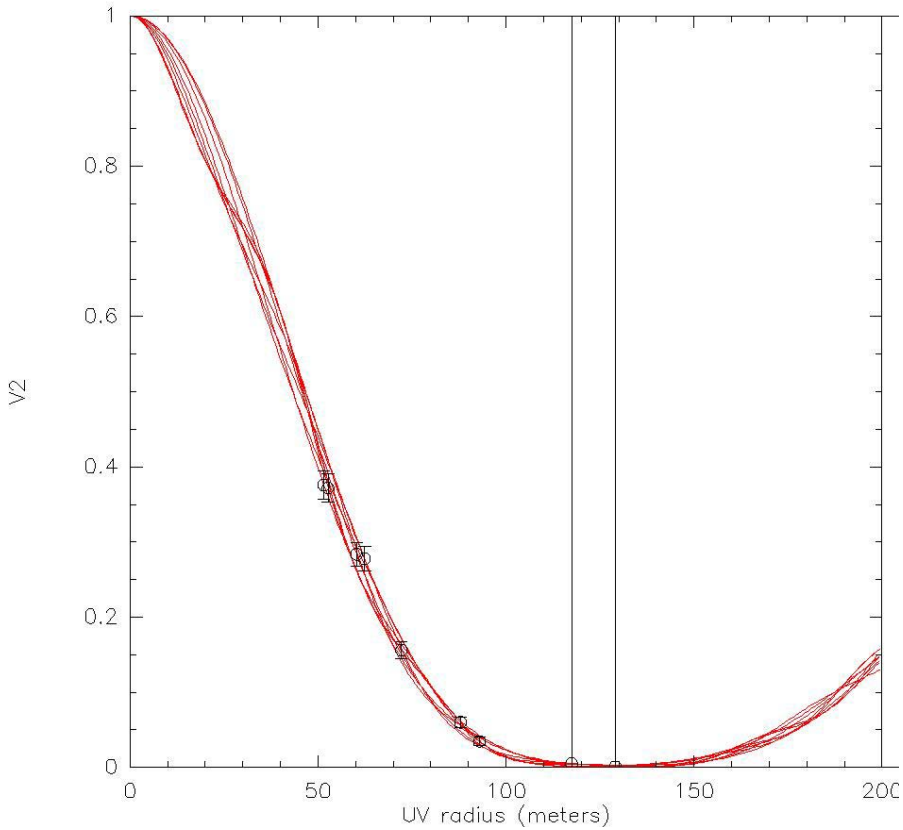
Ring plus binary model



Proposal for VLTI/AMBER observations

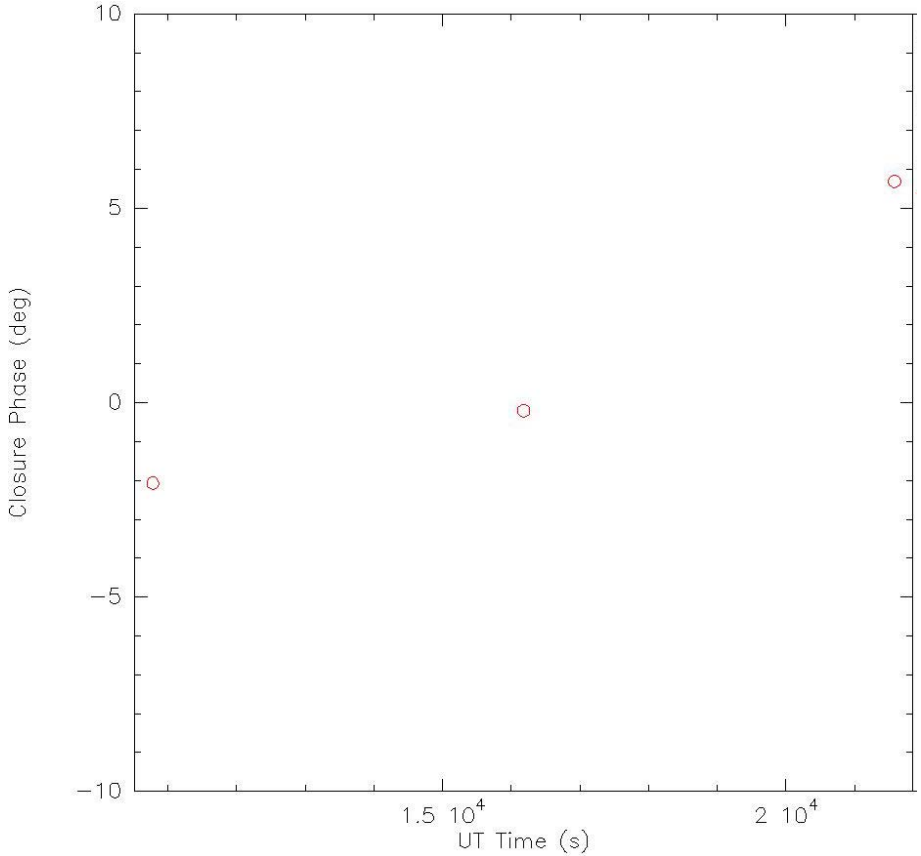
Visibilities

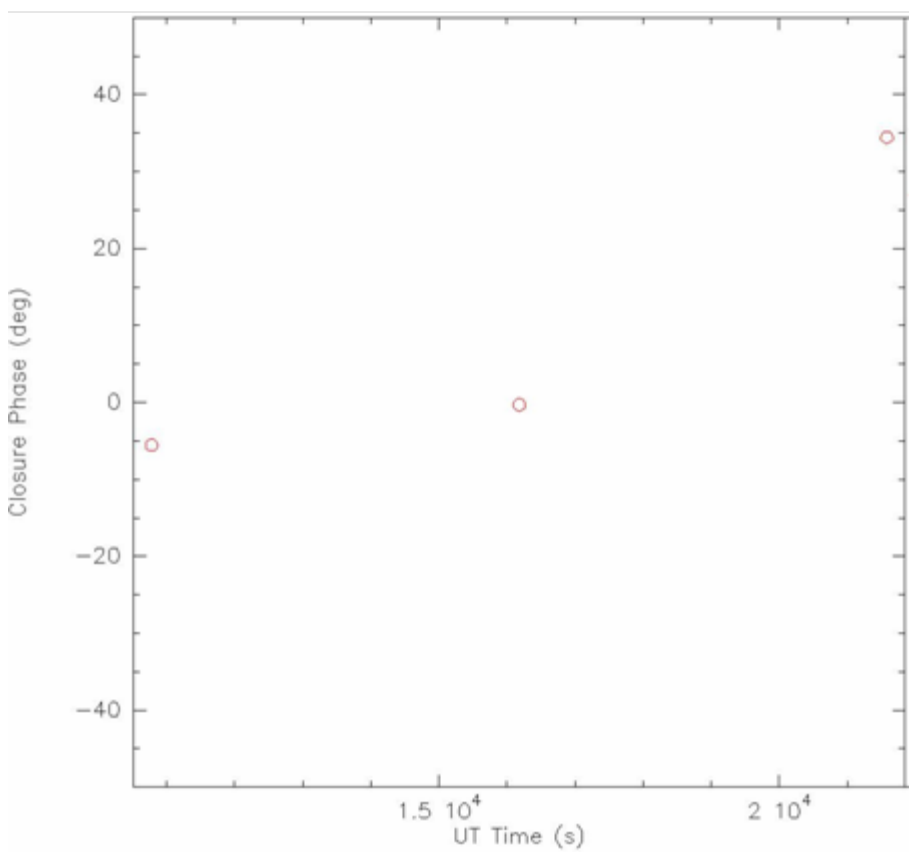




Proposal for VLTI/AMBER observations

Closure Phase





Summary

- YSO are observable with AMBER

- More targets should be observed with VLTI/AMBER to further complete the size-L relation

-The resolution provided by VLTI/AMBER is required to characterize these sources and test the recent disk models

- By means of the CP measurements with VLTI/AMBER we are able to detect asymmetries and test the skewed ring models

- The existence of a disk instability at few AU radii has important implications to the formation of planets in these disks

- These type of measurements (V^2 and CP) could be performed in a similar way in AGN to determine the structure of the putative torus (asymmetries)

- The results on accretion physics in these objects could be used as a reference for future AGN observations and understanding of accretion into a supermassive blackhole